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CALCULUS.

173. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

On one side of a circular pond a feet in radius is a duck. On the diametrically opposite side of the pond is a dog. Both begin to swim at the same time, the duck swimming around the circumference of the pond at the rate of m feet a minute, the dog swimming directly towards the duck at the rate of n feet per minute. How far will the dog swim in overtaking the duck?

174. Proposed by J. EDWARD SANDERS, Weather Bureau, Chicago, Ill.

About the vertices of a regular tetrahedron four spheres are drawn with radii equal to the edge of the tetrahedron. Find the volume common to them all.

175. Proposed by C. N. SCHMALL, 604 East 5th Street, New York City.

Explain fully why the circular measure of an angle is used in the calculus.

MECHANICS.

227. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

Regarding the earth as a homogeneous sphere, radius R, acceleration at the surface g, investigate the motion of a sphere, radius b, moving through a straight tunnel between two points on the surface not diametrically opposite.

228. Proposed by J. E. ROSE, Mount Angel College, Mount Angel, Oregon.

AB, BC are two uniform rods freely hinged at B, whose weights are W, $4W$, and lengths $2a$, $4a$, respectively. The ends A, C of the rods are attached to small rings which slide on a rough horizontal wire. When the distance between the rings is the greatest for which equilibrium can exist, both of them are on the point of slipping. Find the coefficient of friction.

229. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

Find the position of the center of pressure of a semi-elliptical area completely immersed in water, the area being vertical, the bounding axis major being inclined to the horizon at an angle β, and having one extremity in the surface of the water.

230. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

A particle is projected from a distance $a=2r$ from the earth's center towards the earth with a velocity from infinity. If the earth is an airless homogeneous sphere, radius equal to the present mean radius and gravity as at present, with what velocity and in what time will it reach the center through an opening from surface to center?